

CENG311 Computer Architecture
Fall 2014 – Midterm

Duration: 1.5 Hours

Q1 (20pts) Please shortly explain the difference between structural and behavioural coding in VHDL. You can give small examples to better explain if you wish.

Q2 (20pts) The below code is an excerpt from a VHDL program. clk is a clock signal. When we start execution, what would be contents of variable a and b after exactly 100 clock cycles?

```
process(clk)
variable a: integer :=0;
    if clk'event and clk='1' then
        a=a+1;
    end if;
end process;
process(clk)
variable b: integer :=0;
    if clk'event and (clk='1' or clk='0') then
        b=b+1;
    end if;
end process;
```

Q3 (20pts) Assume that an interrupt service routine (ISR) is so long that a new interrupt signal is received before terminating the ISR. Generally microprocessors have interrupt disabling and enabling commands to overcome this problem such that in the beginning of ISR, the interrupt mechanism is disabled and then re-enabled right before exiting ISR. If enabling/disabling feature does not exist, what could be the implications of this situation? Please explain shortly.

Q4 (20pts) μ Pabs-2 has 8-bit address bus and 8-bit data bus. We want to connect two 8255 PIO ICs (8255 has 2-bit address input) and one 128-bytes RAM to μ Pabs-2.

- a) Show how you place the devices on the memory map (Considering partial address decoding technique).
- b) Please design an address decoder circuit that produces the necessary chip select signals to 8255s and RAM. Do not draw the complete circuit, please just draw the address decoder circuit.

Q5 (20pts) Assembly commands **mov A, A** and **nop** (no-operation) are semantically identical. Which one do you prefer to implement idle time and why? (HINT: Think about energy consumption. Depending on the command executed, some parts of the processor can be disabled to reduce energy consumption.)

Your answers: